

Claims

1. A system for confocal imaging tissue comprising:  
means for generating an illumination beam;  
optics for scanning the beam to the tissue and receiving returned illumination from the tissue representing a section of the tissue in which said optics has means for controlling the polarization state of the illumination beam and the returned illumination; and  
means for detecting the returned illumination to form an image of the section of the tissue.
2. The system according to Claim 1 wherein said means for controlling the polarization comprises means for maintaining cross polarization of the illumination beam and the returned illumination from the tissue.
3. The system according to Claim 2 wherein said light in the illumination beam is polarized in a p-state and the returned illumination is polarized to an s-state.
4. The system according to Claim 1 wherein said sample is located in a solution which enhances the brightness of one or more tissue structures in the image of the section of the tissue.
5. The system according to Claim 4 wherein said solution has an acid component.
6. The system according to Claim 5 wherein said acid component is one of acetic acid and vinegar.
7. The system according to Claim 1 wherein tissue represent the excised tissue of a patient, said optics comprise at least an objective lens for focusing the illumination beam to the tissue and collecting returned illumination from the tissue, and said system further comprises:  
a container having a liquid in which said tissue is disposed in said container in said liquid; and  
means for placing said tissue under tension against a surface in said container while enabling imaging of the tissue by said objective lens.

8. The system according to Claim 1 further comprising means for moving said sample with respect to said objective lens.
9. The system according to Claim 1 wherein said means for controlling the polarization state comprises means capable of changing the polarization of the illumination beam and the polarization of the returned illumination from the sample.
10. The system according to Claim 9 wherein said means capable of changing the polarization comprises a half-wave plate and a quarter-wave plate through which passes said illumination beam to said sample, and a linear polarizer through which passes the returned illumination from said sample.
11. The system according to Claim 10 wherein at least one of said half-wave plate, quarter-wave plate, and linear polarizer have means for rotation to change the polarization of the light passing there through.
12. The system according to Claim 1 wherein said tissue has an image enhancing agent, and said polarization controlling means is capable changing the polarization state of at least one of the illumination beam and the returned illumination to effect characteristics of tissue structures in the image of the tissue section to enable determination of which of the tissue structures are cancerous.
13. The system according to Claim 12 wherein said tissue is skin tissue.
14. The system according to Claim 1 wherein the tissue is one of naturally exposed tissue and surgically excised tissue.
15. A system for providing enhanced images in confocal microscopy which is characterized by utilizing cross polarized light in the illumination of tissue and in the detection of light from which the images are formed, respectively, and wherein an image enhancing agent is used in a bath in which the specimen is immersed while being imaged.
16. The system according to Claim 15 wherein said image enhancing agent is one of acetic acid and vinegar.

17. A method for confocal imaging tissue comprising the steps of:  
generating an illumination beam;  
scanning the beam to the tissue;  
receiving returned light from the tissue representing of a section of the tissue;  
cross polarizing the illumination beam and the returned light with respect to each other; and  
detecting the returned light to form an image of the section of the tissue.
18. The method according to Claim 17 further comprising the step of locating said sample in a solution which enhances the brightness of one or more tissue structures in the image of the section of the tissue.
19. The method according to Claim 18 wherein said solution has an acid component.
20. The method according to Claim 19 wherein said acid component is one of acetic acid and vinegar.
21. The method according to Claim 17 wherein said tissue has an image enhancing agent, and said polarization controlling step further comprises the step of changing polarization state of at least one of the illumination beam and the returned light to effect characteristics of tissue structures in the image of the tissue section to enable determination of which of the tissue structures are cancerous.
22. The method according to Claim 21 wherein said tissue is skin tissue.
23. The system according to Claim 17 wherein the tissue is one of naturally exposed tissue and surgically excised tissue.
24. A method for detecting cancerous basal cell and squamous cell in dermal tissue with confocal reflected light imaging, said method comprising the steps of:  
washing the tissue to be imaged with a solution which whitens epithelial cells and compacts chromatin of the tissue;

imaging the tissue with a confocal microscope to provide confocal images of basal and squamous cells in which the confocal microscope directs light into the tissue and collects reflected light representing confocal images of the tissue;

changing the polarization state of the light used by the confocal microscope to increase the contrast of the nuclei of basal and squamous cells in the confocal images; and

analyzing the nuclei of the basal and squamous cells in the confocal images to diagnose which of such cells are cancerous.

25. The method according to Claim 24 wherein said solution is of acetic acid.